

# LAC CULTURE OPERATIONS

When  
Why  
How

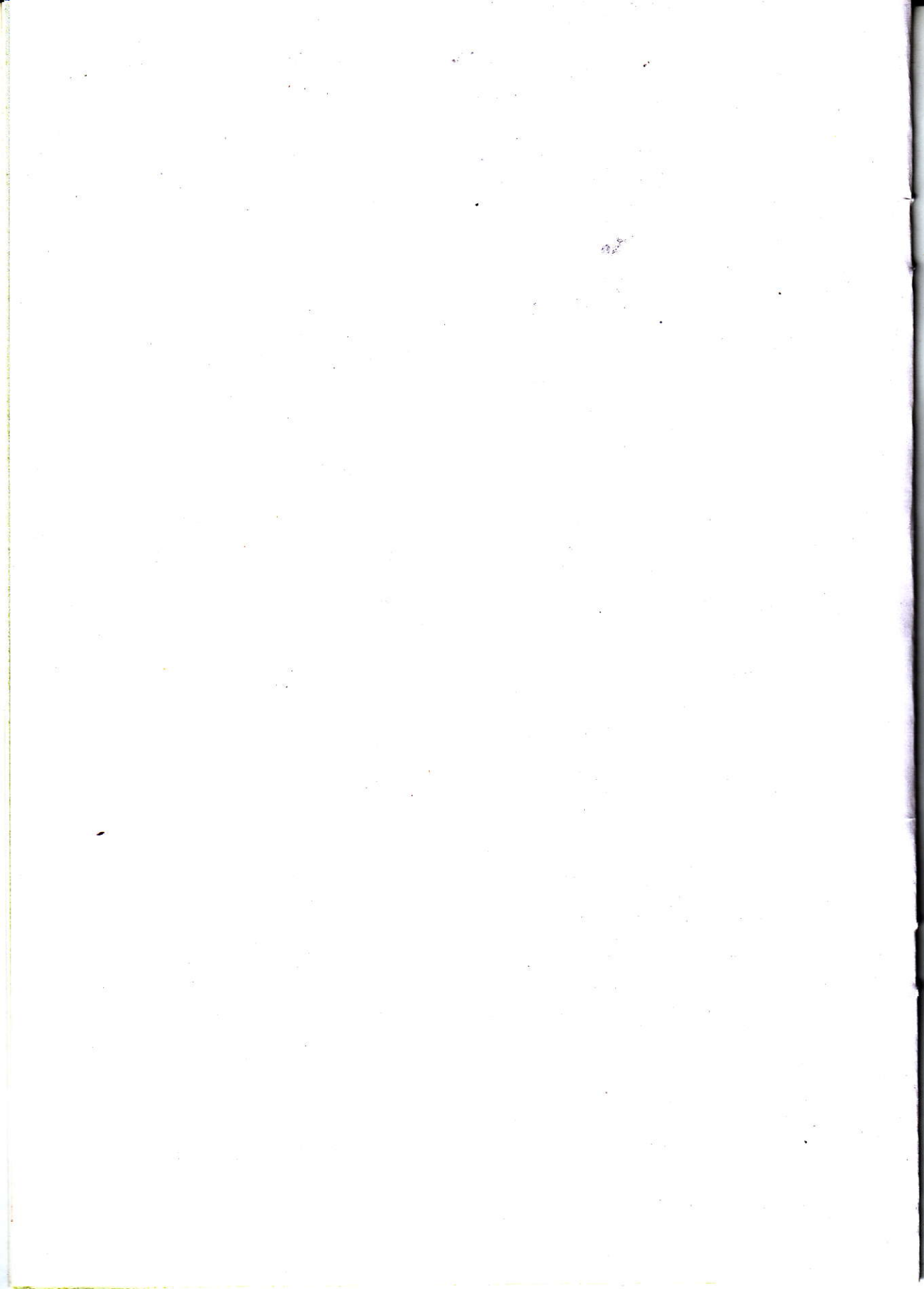


**Indian Institute of Natural Resins and Gums**

(Indian Council of Agricultural Research)

Namkum, Ranchi (Jharkhand) 834 010





# LAC CULTURE OPERATIONS -WHEN, WHY & HOW?

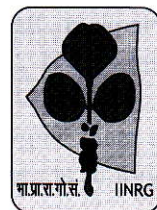
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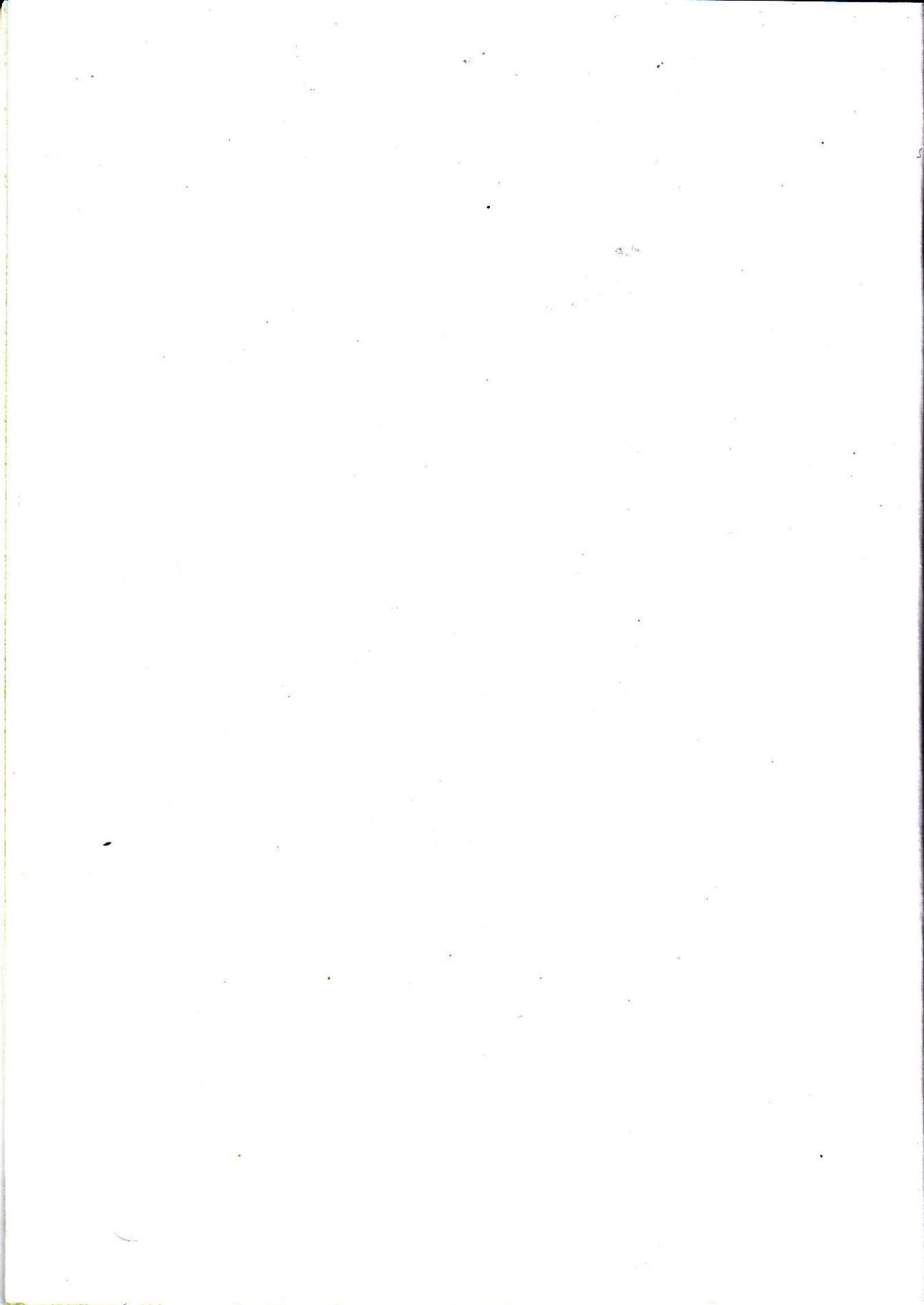
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## Preface

Lac cultivation is the subsidiary source of income for rural and forest dwellers. India has vast resource potential to produce lac. Major lac producing states in India are Jharkhand, Chhattisgarh, Madhya Pradesh, West Bengal, Odisha, Andhra Pradesh, Maharashtra and Uttar Pradesh. There are areas in the country which have potential for lac production but due to lack of knowledge it is not done. In the existing lac cultivation areas, there is further scope to enhance productivity by adoption of scientific lac cultivation technologies. Adoption of improved method of lac cultivation is not only very easy in view of meagre requirement for labour, time and money but also it generates high income in comparison to other agriculture crops. Considering the requirement of students, farmers, entrepreneurs and others, the second edition of this book is being presented in a more refined form. New research findings also have been incorporated in easy and understandable manner, so that every reader of this book is benefitted. Though, Hindi version of this made available to all trainees of the institute but it was realised that students and people of non-Hindi speaking areas do not have reading material in a language which they understand. Therefore, this English edition has been brought out so that lac cultivation - a useful agricultural intervention for resource constrained farmers-spreads effectively in such potential areas.

A K Jaiswal  
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## LAC CULTURE OPERATIONS - WHEN, WHY & HOW?

Lac is a natural resin secreted by the tiny lac insects, mainly *Kerria lacca* (Kerr), for protection of young ones and self. The insects are cultured on tender shoots of several plants called hosts. It derives its nutrition by sucking the saps from the host plants. There are two strains (biotype) of the lac insect namely- *rangeeni* and *kusmi*. Each of these strains completes its life cycle twice in a year, thus producing two crops in a year. However in coastal region of West Bengal and Orissa, a tri-voltine insect, *Kerria sharda* is found which produce three crops in a year. The crop periods and duration of biotypes has been provided in Table 1. The suitability of lac hosts for different crops has been given in Table 2.

**Table 1.** Different crops and their life period

Strain/ biotype	Crop	Season	Period		Approx. Duration (Months)
			Raised (Inoculated)	Mature (Harvested)	
<i>Rangeeni</i>	KATKI	Rainy	June/July	October/ November	4
	BAISAKHI	Summer	October/ November	June/July	8
<i>Kusmi</i>	AGHANI	Winter	June/July	January/February	6
	JETHWI	Summer	January/February	June/July	6
Trivoltine		Winter	October/ November	March/April	5
		Summer	March/April	July/August	4
		Rainy	July/Aug	October/ November	3

**Table 2.** Lac- host plants and their suitability

Sl	Host	Common name	Strain	Suitable Crop
Major hosts:				
1.	<i>Butea monosperma</i>	Flame of forest	<i>Rangeeni</i>	Summer and Rainy
2.	<i>Schleichera oleosa</i>	<i>Kusum</i>	<i>Kusmi</i>	Summer and Winter
3.	<i>Ziziphus mauritiana</i>	<i>Plum tree</i>	<i>Rangeeni</i>	Premature summer
4.	<i>Z. mauritiana</i>	<i>Plum tree</i>	<i>Kusmi</i>	Winter
Other hosts:				
5.	<i>Acacia catechu</i>	<i>Khair</i>	<i>Kusmi</i>	Winter
6.	<i>Albizia lebbek</i>	<i>Siris</i>	<i>Kusmi</i>	Winter
7.	<i>Albizia lucida</i>	<i>Galwang</i>	<i>Kusmi</i>	Summer
8.	<i>Albizia saman</i>	<i>Rain tree</i>	<i>Rangeeni</i>	Summer and Rainy
9.	<i>Croton oblongifolius</i>	<i>Putri</i>	<i>Rangeeni</i>	Summer

10.	<i>Ficus cunea</i>	<i>Porho</i>	<i>Rangeeni</i>	Summer
11.	<i>F. glabella</i>	<i>Putkal</i>	<i>Rangeeni</i>	Summer
12.	<i>F. glomerata</i>	<i>Dumber</i>	<i>Rangeeni</i>	Summer
13.	<i>F. infectoria</i>	<i>Pakur</i>	<i>Rangeeni</i>	Summer
14.	<i>F. religiosa</i>	<i>Pipal</i>	<i>Rangeeni</i>	Summer
15.	<i>Flemingia semialata</i>	<i>Semialata</i>	<i>Kusmi</i>	Winter
16.	<i>Ougeinia dalbergioides</i>	<i>Sandan or pandan</i>	<i>Kusmi</i>	Winter
17.	<i>Protium serratum</i>	<i>Kandeur</i>	<i>Kusmi</i>	Winter
18.	<i>Ziziphus xylopyra</i>	<i>Ghont</i>	<i>Rangeeni</i>	Premature summer

### Major Lac Cultivation Operations:

(1) Pruning of trees (2) Infestation of lac hosts (inoculation) (3) Removing of used-up broodlac sticks (4) Pest management (5) Harvesting (6) Scraping of lac from twigs

### STEPS AND OPERATIONS OF LAC CULTURE

#### 1. PRUNING: Removing (Cutting) undesirable shoots of host plant.

WHEN • *Palas, ber, galwang* and *semialata* - Six months before inoculation.

• *Kusum* and *akashmani* - Eighteen months before inoculation.

• *Palas* : *Katki* – Middle of February; *baisakhi* - April

• *Ber* : *Baisakhi* - May : *aghani*- February

• *Galwang* : *Jethwi*- June / July; *baisakhi*- April

• *Semialata* : *Aghani* - June /July

• *Kusum* : *Aghani* - January/ February; *jethwi* - June/ July

WHY • To ensure availability of good, healthy and succulent (tender) shoots.

• To ensure availability of large number of shoots (area for lac culture).

• To provide rest to host trees for maintaining its potential.

• To remove dead, diseased and broken branches.

HOW • Prune the host lightly in such a way as to keep the good shape and allow plenty of space for growth of new shoots.

• Pruning is carried out in such a way so that one can get easy access of the lac encrusted shoot at the time of harvesting.

• Use sharp axe or dauli, secateur or tree pruner for pruning.

• Branches more than 2.5 cm. in diameter should not be cut.

• Branches less than 1.5 cm. in diameter should be cut from the point of origin.

• Branches in between 1.25 - 2.5 cm in diameter should be cut leaving 1 - 1.5 ft. length from the point of origin.

• While pruning for the first time, thick branches also are required to be cut for better canopy management.

• Remove the dry, diseased, broken twigs from the damaged portion.



2. **INOCULATION:** Tying of broodlac bundles (lac stick with mature female insect) on host twigs for release of young lac larvae (crawlers).

- WHEN
- Normally in the month of January/February and June/July for *jethwi* and *aghani* crop of *kusmi* strain respectively.
  - In the month of October/ November and June/July for *baisakhi* and *katki* crop of *rangeeni* strain, respectively.
- Why
- To raise new crop of lac.
- HOW
- Remove the leaves and unwanted portion of the shoot from broodlac.
  - Cut broodlac sticks preferably 15 -20 cm. in length.
  - Weigh about 1 kg broodlac and divide into approximately into 10 equal parts.
  - Prepare the bundles of broodlac (about 100 g by weight) and tie with plastic sutli both the end by keeping a bit longer for tying on the shoots.
  - Tie the bundles of broodlac on the lower part of the pruning point parallel to shoots where approximately 5-10 succulent shoots are available.
  - Use 60 mesh nylon netting bag (33 x 10 cm. or of convenient size) if available, to put broodlac inside and then tie on shoots of the host tree, allowing lac insect crawlers to come out and lac predators/ parasites to trapped inside.
  - One metre long broodlac is sufficient for 10 - 15 m. long inoculable shoots.
  - While inoculating *kusum* trees prefer to inoculate the trees with broodlac on outer side for *aghani* and inner side of the host crown, for raising *jethwi* crop.

3. **REMOVAL OF USED-UP BROODLAC STICKS (PHUNKI):**

Used-up broodlac sticks after complete emergence of lac larvae from female cells is called *phunki*.

- WHY
- To prevent access of the insect predators and parasitoids of lac insect to new lac crop.
  - To avoid wastage of lac after drying up of *phunki* and prevent its falling on ground.
- WHEN
- Remove the *phunki* as soon as emergence of lac crawlers is over.
  - Normally swarming is completed within 3 weeks of inoculation.
- How
- Use small *dauli* or *phunki* removal hook mounted on top of a bamboo without climbing on tree.

4. **PEST MANAGEMENT (SPRAY OF PESTICIDES):**

**Insecticides:** Cartap hydrochloride 50 SP (e.g. Caldan) for control of *Eublemma amabilis* and *Pseudohypatopa pulverea* or ethofenprox 10 E.C. (Nukil) for control of *Chrysopa* spp (Neuroptera), *Eublemma amabilis* and *Pseudohypatopa pulverea* (Lepidopteran).

**Fungicide:** Carbendazim 50% W P (e.g. Derosal or Bengard or Bavistin etc) for control of fungi. Normally used during rainy season.

(Use pesticides only after observing incidence of insect predators)

- WHEN
- One month after inoculation ethofenprox (10 E C) 0.02% or cartap hydrochloride (50% SP) 0.05%
  - Spray second time after one month from the first spray, if necessary
  - Spray only before male emergence period or when fertilization is completed
  - For summer crop of *rangeeni* (*baisakhi*): cartap hydrochloride (50% W P) 0.05% or ethofenprox 0.02% at 30<sup>th</sup> day of inoculation sometimes in November and second spray sometimes in January or March (no spray between 105-125 days during *baisakhi* and 42-58 days of inoculation for *katki* crop
  - Summer crop of *kusmi* (*jethwi*): ethofenprox 0.02% on 30<sup>th</sup> and 60<sup>th</sup> day of inoculation or larval emergence (No spray between 65-90 days of inoculation)
  - Winter crop of *kusmi* (*aghani*): Cartap hydrochloride (50 % SP) or ethofenprox 0.02% + carbendazim (50% WP) 0.01% on 30<sup>th</sup> day of inoculation. Repeat same after one week (second spray) and third spray on 60<sup>th</sup> day of inoculation, if lac crop is attacked by *Chrysopa* sp and fungi (No spray between 40-58 days of inoculation)
  - Spray carbendazim (50% WP) 0.01% only, especially in rainy season or during cloudy weathers at the interval of 15 days but not during mating period
- HOW
- Spray the insecticide formulation on the culture of lac insect settled on shoot and not over leaves or shoot without lac insect.
  - Ethofenprox (10 E C) 0.02% = 2 ml per litre of water.
  - Cartap hydrochloride (50 % SP) 0.05% = 1 g per lit of water
  - Ethofenprox 0.02% + carbendazim 0.01 % = 15 litre water + 30 ml ethofenprox + 3 g carbendazim (50% WP)

5. **HARVESTING:** Cutting of mature (broodlac) or immature (*ari*) lac crop from the host along with host sticks.

(i) **ARI HARVESTING IN PALAS & BER:**

- Harvest *ari* lac (immature) in April from *palas* or in 3<sup>rd</sup> /4<sup>th</sup> week of May from *ber* and prune the trees simultaneously.
- Dry the scraped lac in shade with sufficient aeration.

(ii) **PARTIAL HARVESTING:**

- WHEN
- Perform partial harvesting only if there is surplus broodlac on host in the month of June/ July from *palas* tree of broodlac coupe of trees.
  - In the month of January/February or June/July whenever larval emergence starts from *kusum* tree.
  - Use harvested broodlac either for inoculation of other trees or to earn money by selling in market.
- HOW
- Harvest lac encrusted shoots from places where there is no further space for the insect settlement.
  - Leave lac encrusted twigs at places where space for lac insect settlement is available.
  - Use of Secateur for harvesting of broodlac is preferred.

### (iii) COMPLETE HARVESTING:

- WHEN
- *Palas*: In October/ November from broodlac set trees and in middle of April from *baisakhi* crop of *ari* set of trees.
  - In summer crop (*jethwi* and *baisakhi*) may be harvested 4-5 days before larval emergence i.e. when the yellow spot appears.
  - Winter crop (*aghani* and *katki*) harvest only when a few crawlers seen over encrustation.
  - Harvest broodlac from parent trees only when all preparation for inoculation of new tree is completed.
- HOW
- Follow rules of pruning while harvesting *kusum*.
  - Select broodlac in the field itself.

### GROUPING OF HOST TREES (Set System):

- WHY
- The host gets the opportunity to rest and rejuvenate itself.
- (Benefits)
- Ensures self-sufficiency in broodlac production
  - Gives more succulent shoots.
  - Ensures regular income.
  - Provides sustained and higher yield.
  - Minimises incidence of predators and parasites.

#### I. *Butea monosperma* (Palas) & *Ziziphus mauritiana* (ber)

- Divide the total trees into three groups (sets) with equal number of trees in each (Table 3).
- Use two group of trees for broodlac production and remaining one for immature *baisakhi* (*ari*) crop
- If *ber* trees are also available make two groups of *palas* and third of *ber* tree use it for immature *baisakhi* (*ari*) crop but harvest it sometimes in late May instead of April (Table 4).
- Keep good and healthy trees in broodlac sets and unhealthy (on which normally mortality occurs in summer) for *ari* crop.
- Trees on which lac culture is prone to mortality due to high temperature during summer (normally located on rocks or where ground water level is very low) may be utilised either for immature *baisakhi* crop or *katki* crop only.

#### (a) Broodlac set:

- Divide broodlac group of trees in two sets having equal number of trees.
- Carryout all the cultivation operations on these two sets in alternate years.
- One metre length of broodlac sticks are sufficient to inoculate about 12.5 meters length of shoot

**Table 3.** *Rangeeni* broodlac production schedule for *palas*

Year	Month	Broodlac set-I ( <i>Palas</i> )	Broodlac set-II ( <i>Palas</i> )
First	April	Pruning	
	Oct/ Nov	Inoculation	
Second	April		Pruning
	Jun/ Jul	Self inoculation	
	Oct/ Nov	Brood harvesting →	Inoculation
Third	April	Pruning + <i>ari</i> collection	
	Jun/ Jul		Self inoculation
	Oct/ Nov	Inoculation ←	Brood harvesting
Fourth	April		Pruning + <i>ari</i> collection
	Jun/ July	Self inoculation	
	Oct/ Nov	Brood harvesting →	Inoculation
Fifth	April	Pruning + <i>ari</i> collection	

**Table 4.** Lac cultivation schedule for *palas* (*Butea monosperma*) & or *ber* (*Ziziphus mauritiana*)

Year	Month	Broodlac set-I ( <i>Palas</i> )	Immature ( <i>ari</i> ) set ( <i>Palas/Ber</i> )	Broodlac set-II ( <i>Palas</i> )
First	April	Pruning		
	Oct/ Nov	Inoculation		
Second	April		Pruning	Pruning
	Jun/ Jul	Self inoculation		
	Oct/ Nov	Brood harvesting →	Inoculation →	Inoculation
Third	April	Pruning + <i>ari</i> collection	<i>ari</i> -harvesting + Pruning	
	Jun/ Jul			Self inoculation
	Oct/ Nov	Inoculation ←	Inoculation ←	Brood harvesting
Fourth	April		<i>ari</i> -harvesting + Pruning	Pruning + <i>ari</i> collection
	Jun/ July	Self inoculation		
	Oct/ Nov	Brood harvesting →	Inoculation →	Inoculation
Fifth	April	Pruning + <i>ari</i> collection	<i>ari</i> - harvesting + Pruning	

- By weight, 350-400 g of good quality broodlac (10-15 g per metre) is needed for inoculation in October/ November on a medium sized tree of *palas*.
- Inoculate the pruned trees in October/ November and harvest broodlac after one year in same month when crop is mature, permitting self colonisation in the month of June/ July.
- Harvest the excess broodlac lac from trees to earn some money in the month of June/July.
- Leave small quantity of scattered lac (*cheri- cheti*) in October/ November (when brood is harvested) and allow it to develop as encrustation to be collected as immature (*ari*) lac, while pruning the trees in the month of March or April.
- Remove twigs with dead insects from the host plant every year in the month of April while pruning the trees.

**(b) Immature (*ari*)-lac set:**

- Brood rate for inoculation: *palas* and *ber*: 20-25 g/metre shoot length.
- By weight 1.0 or 1.5 kg of broodlac is needed for inoculation of a medium sized *palas* and 2.0 or 2.5 kg for *ber* tree respectively.
- Inoculate in the month of October/ November and harvest in April from *palas* tree and in May from *ber* trees.

**II. *Schleichera oleosa* (KUSUM)**

- Divide the total trees into five groups (sets) with equal number of trees in each set (Table 5).
- Take combined crop of *aghani* + *jethwi* or *jethwi* + *aghani* every year on each set but with partial harvesting after 6 month of inoculation.
- Harvest the crop completely after one year of inoculation and simultaneously prune the trees.
- Inoculate one set of trees for raising *aghani* + *jethwi* at every six months interval or *jethwi* + *aghani* crops in subsequent years.
- Inoculate the trees after 18 months of pruning depending on availability of shoot.
- Inoculate the trees in the month of January/ February for raising *aghani* + *jethwi* crop and June/July for *jethwi* + *aghani* crop.
- To inoculate the trees, use the broodlac obtained from partial harvesting of another set.
- To estimate the requirement of broodlac per tree, calculate @ of 20 g for one metre tender shoot length.
- Normally 4-8 kg of broodlac is required per tree for raising lac culture.

**Table 5.** Lac cultivation schedule on *Kusum* (*Schleichera oleosa*)

Year	Month	Set- I	Set- II	Set- III	Set- IV	Set- V
<b>First</b>	January/ February	Pruning				
	June/July		Pruning			
<b>Second</b>	January/ February			Pruning		
	June/ July	Inoculation			Pruning	
<b>Third</b>	January/ February	Partial → harvesting	Inoculation			Pruning
	June/July	Complete harvesting & pruning	Partial → harvesting	Inoculation		
<b>Fourth</b>	January/ February		Complete harvesting & pruning	Partial harvesting	Inoculation	
	June/July			Complete harvesting & pruning	Partial → harvesting	Inoculation
<b>Fifth</b>	January/ February	Inoculation	←		Complete harvesting & pruning	Partial harvesting
	June /July	Partial harvesting	Inoculation ←			Complete harvesting & pruning

### III. *Schleichera oleosa* (*Kusum*) & *Ziziphus mauritiana* (*Ber*)

- Devide total trees of *kusum* in two sets with equal number of trees in each (Table 6).
- *Kusum* trees are utilised for summer crop (*jethwi*), pruned in June or July, inoculated in January or February after 18 months and harvested in June or July during alternate years.
- *Ber* trees have only one set and utilised for winter crop (*aghani*) every year, pruned in February, inoculated in June or July and harvested in January or February.
- Trees are also pruned at the time of harvesting.
- Initially *ber* trees are pruned in late January or February.
- Broodlac obtained from *kusum* tree is utilised for inoculation of *ber* and vice- versa.
- Excess broodlac obtained from both set of trees is sold in the market.
- *Kusum* trees get rest of one and half year but *ber* only get 5-6 months.
- Inoculation is carried out with broodlac @ 20- 25 g broodlac per meter shoot for both species of tree.

**Table 6.** Cultivation schedule for *kusmi* lac on *Ziziphus mauritiana* (plum) & *Schleichera oleosa* (Kusum) tree

Year	Month	<i>S. oleosa</i> (Summer crop)	<i>Z. mauritiana</i> (Winter crop)	<i>S. oleosa</i> (Summer crop)
First	June/ July	Pruning	.	
Second	January/ February		Pruning	
	June-July		Infestation	Pruning
Third	January/ February	Infestation ←	Harvesting + Pruning	
	June/July	Harvesting →	Infestation	
Fourth	January/ February		Harvesting + Pruning →	Infestation
	June/July		Infestation ←	Harvesting
Fifth	January/ February	Re-infestation ←	Harvesting + Pruning	
	June/July	Harvesting →	Infestation	
Sixth	January/ February		Harvesting + Pruning →	Re- Infestation
	June/July		Infestation ←	Harvesting

#### IV. PALAS & Australian babool (AKASHMANI)

- Divide the total trees of *palas* and *akashmani* into two sets each (Table 7).
- Each set either of *palas* or of *akashmani* should have equal number of trees.
- The number of trees in *akashmani* set should be 4 times than that of number of trees in *palas* set (*Palas: akashmani* = 1:4 ).
- Use *palas* trees for raising summer season (*baisakhi*) crop and *akashmani* for raising rainy season crop.
- For inoculating trees of *akashmani*, use the broodlac from *palas* and vice-versa.
- Inoculate the trees of *palas* and *akashmani* with broodlac @ 20 g for one metre tender shoot.
- Normally 500 g broodlac is required for a medium sized tree of *akashmani*.
- Sell the surplus broodlac and *phunki* scraped lac in the market at the earliest.

#### V. KUSUM & AKASHMANI

- Divide the total trees of *kusum* and *akashmani* into two sets each (Table 8).
- Each set either of *kusum* or of *akashmani* should have equal number of trees.
- The number of trees in *akashmani* coupe should be 40 times than that of *kusum* (*kusum : akashmani* = 1:40).

**Table 7.** Lac cultivation schedule on *Acacia auriculiformis* (Akashmani) & *Butea monosperma* (Palas)

Year	Month	Palas-I (baisakhi cum katki crop)	Akashmani-I (katki)	Palas -II (baisakhi cum katki crop)	Akashmani- II (katki)
First	Oct/ Nov		Pruning		
Second	April	Pruning			
	Oct/ Nov	Inoculation			Pruning
Third	April			Pruning	
	June/July	Excess brood harvesting	Inoculation		
	October/ November	Broodlac harvesting	Broodlac harvesting	Inoculation	
Fourth	April	ari harvesting cum pruning	ari collection cum pruning		
	June/July			Excess brood harvesting	Inoculation
	October/ November	Re-inoculation		Broodlac harvesting	Brood harvesting
Fifth	April			ari harvesting cum pruning	ari collection cum pruning
	June/July	Excess brood harvesting	Inoculation		
	October/ November	Broodlac harvesting	Harvesting + pruning	Re-inoculation	Re-inoculation

**Table 8.** Cultivation schedule on *kusum* and *akashmani*

Year	Month	Akashmani -I (winter crop)	Kusum -I (summer crop)	Akashmani -II (winter crop)	Kusum-II (summer crop)
First	January/ February	Pruning			
	June/July		Pruning		
Second	January/ February			Pruning	
	June/July	Inoculation			Pruning
Third	January/ February	Harvesting & pruning	Inoculation		
	June/July		Harvesting & pruning	Inoculation	
Fourth	January/ February			Harvesting & pruning	Inoculation
	June/July	Inoculation			Harvesting & pruning



- Use *kusum* trees for raising summer season (*jethwi*) crop and *akashmani* for winter season (*aghani*) crop.
- Use *kusum* tree broodlac for inoculation of *akashmani* and vice- versa.
- Inoculate *kusum* and *akashmani* trees with broodlac @20 g per metre shoot length.
- Prune the trees of *akashmani* in the month of January - February and *kusum* trees in the month of June /July, 18 months prior to inoculation.

#### VI. *Flemingia semialata*

- Plants are inoculated in June/ July for raising winter crop of *kusmi* (*aghani*).
- The plant are raised in nursery beds or poly- bags from seeds in April, before the onset of monsoon (Table 9).
- The saplings are transplanted in pits at the distance of 1.0 m X 1.0 m after onset of monsoon.
- Plants can be utilised for raising lac crop one year after transplantation for the first crop.
- Around 10-15 cm long *kusmi* broodlac stick, weighing around 30 g is sufficient to inoculate one plant.
- The insects are allowed to settled on 30-45 cm length on each shoot, after that broodlac is removed and tied on other plant if emergence is still on.
- The lower leaves are removed at the 35-40 days of inoculation for facilitating aeration.
- Use early maturing *kusmi* breed for raising crop on *Flemingia semialata* to avoid detachment of lac encrustation from the shoots and provide irrigation at fortnightly interval during December –January.
- Harvest the lac crop or prune the shoots from about 5 cm above the ground.
- The plants will be ready for re-inoculation in June/July again.

#### VII. *Albizia lucida* (*Galwang*)

- The plants are useful for summer crop of *kusmi* and can be utilised in alternation with *ber* or *semialata* species (Table 9).
- The plant can be raised from seeds in poly-bags and transplanted in the field after the onset of the monsoon.
- Train trees into bushes.
- Age of trees for raising lac crop; *galwang* - 4 years after transplantation.
- Age of shoots for inoculation - 6 months.

**Table 9.** Lac cultivation schedule on *Flemingia semialata* (*semialata*) and *Albizia lucida* (*galwang*)

Year	Month	<i>Flemingia semialata</i>	<i>Albizia lucida</i>
First	January/ February	Pruning	
	June/July	Inoculation	Pruning
Second	January/ February	Crop harvesting + Pruning	Inoculation
	June/July	Inoculation	Crop harvesting
Third	January/ February	Crop harvesting + Pruning	Inoculation

- Requirement of broodlac per tree- 200 to 250 g (20-25 g per meter of tender shoot)
- Harvesting of lac crop in June or July when lac crawlers start emerging.
- Prune the trees at the time of harvesting itself.
- Broodlac obtained can be utilised for inoculation of *Flemingia* or *ber* trees for raising *aghani* crop.

#### VIII. *Ficus cunea* (*Porho*)

- The plants may be divided into two groups, if utilised exclusively (Table 10).
- This species is useful for summer crop of *rangeeni* and hence normally utilised and called as summer broodlac preserver.
- First time pruning may be done in April i.e. six months prior to inoculation.
- The tree is inoculated in October/ November and matured *baisakhi* crop, in the form of broodlac is harvested and inoculated on other hosts.
- Major harvesting of broodlac can be done in July and complete in October or November.

**Table 10.** *Rangeeni* lac cultivation on *Ficus cunea*

Year	Month	Set-I	Set-II
First	April	Pruning	
	October	Inoculation	
Second	April		Pruning
	June/July	Brood harvesting	
	October/ November	Complete harvesting	Inoculation
Third	June/ July		Brood harvesting
	October/ November	Inoculation	Complete harvesting

## LAC CULTURE - TIME TABLE

MONTHS	KUSMI	RANGEENI
JANUARY	<ul style="list-style-type: none"> <li>Forecast of larval emergence from winter crop (<i>aghani</i>).</li> <li>Pruning of new <i>Kusum</i> trees.</li> </ul>	<ul style="list-style-type: none"> <li>Cleaning of termite from <i>palas</i> and <i>ber</i> trees.</li> <li>Spray of insecticide in last week (Before male emergence).</li> </ul>
FEBRUARY	<ul style="list-style-type: none"> <li>Pruning of new <i>Kusum</i> trees</li> <li>Harvesting of <i>aghani</i> crop and simultaneously pruning of trees</li> <li>Inoculation of summer crop (<i>jethwi</i>) using nylon net.</li> <li><i>Phunki</i> removal and scraping.</li> <li>Pruning of <i>ber</i> trees for inoculation in July or August.</li> </ul>	<ul style="list-style-type: none"> <li>Partial harvesting of inoculated trees of <i>palas</i>.</li> </ul>
MARCH	<ul style="list-style-type: none"> <li>First spray of ethofenprox on lac culture</li> </ul>	<ul style="list-style-type: none"> <li>Estimation of yield of <i>sticklac</i> from <i>baisakhi ari</i>.</li> </ul>
APRIL	<ul style="list-style-type: none"> <li>Second spray of ethofenprox and carbendazim at 60 days of inoculation</li> </ul>	<ul style="list-style-type: none"> <li>Crop harvesting in <i>baisakhi ari</i> sticklac coupe and simultaneously pruning of trees.</li> <li>Pruning of trees in broodlac coupe and also collection of <i>ari</i> lac (left during October/November six months before.)</li> </ul>
MAY	<ul style="list-style-type: none"> <li>Spray of ethofenprox, if attack of <i>Chrysopa</i> is seen (but not between 65-90 days of inoculation)</li> </ul>	<ul style="list-style-type: none"> <li>Scraping of <i>ari</i> lac from sticks and its marketing.</li> </ul>
JUNE	<ul style="list-style-type: none"> <li>Forecast of larval emergence and estimation of yield from <i>jethwi</i> crop</li> <li>Estimation of broodlac requirement for inoculation of <i>aghani</i> crop.</li> </ul>	<ul style="list-style-type: none"> <li>Forecast of larval emergence and estimation of broodlac yield from <i>baisakhi</i> crop.</li> </ul>
JULY	<ul style="list-style-type: none"> <li>Harvesting of <i>jethwi</i> crop partially or fully as per requirement after observing yellow spot.</li> <li>Inoculation of <i>aghani</i> crop</li> <li><i>Phunki</i> removal and scraping.</li> </ul>	<ul style="list-style-type: none"> <li>Leave <i>baisakhi</i> crop in broodlac coupe for self-colonisation.</li> <li>Partial harvesting of excess broodlac in broodlac coupe.</li> </ul>
AUGUST	<ul style="list-style-type: none"> <li>First spray of insecticide ethofenprox, after 30<sup>th</sup> days of inoculation.</li> </ul>	<ul style="list-style-type: none"> <li>First spray of insecticide emulsion (ethofenprox) and fungicide (bavistin) one month after inoculation.</li> </ul>
SEPTEMBER	<ul style="list-style-type: none"> <li>Second spray of insecticide and fungicide emulsion between 37-40 days of inoculation.</li> </ul>	<ul style="list-style-type: none"> <li>Second spray of insecticide ethofenprox (if necessary).</li> <li>Forecast of larval emergence in broodlac coupe.</li> <li>Estimation of broodlac requirement in <i>ari</i> and second broodlac coupe.</li> </ul>
OCTOBER	<ul style="list-style-type: none"> <li>Third spray of insecticide and fungicide emulsion between 60-65 days of inoculation.</li> </ul>	<ul style="list-style-type: none"> <li>Harvesting of broodlac when a few crawlers appear on encrustation.</li> <li>Inoculation of broodlac in <i>ari</i> coupe and in a broodlac coupe.</li> </ul>
NOVEMBER	<ul style="list-style-type: none"> <li>Make arrangement to prevent theft of <i>aghani</i> crop</li> </ul>	<ul style="list-style-type: none"> <li><i>Phunki</i> removal, scraping and disposal of scraped lac.</li> <li>Estimation of incidence of predators and parasitoids.</li> <li>Spray of insecticide (ethofenprox) on lac culture.</li> </ul>
DECEMBER	<ul style="list-style-type: none"> <li>Estimation of yield from <i>aghani</i> crop</li> <li>Estimation of broodlac requirement for <i>jethwi</i> crop.</li> </ul>	<ul style="list-style-type: none"> <li>Second spray of insecticide on lac culture (if needed).</li> </ul>

## Raising of lac host plantation

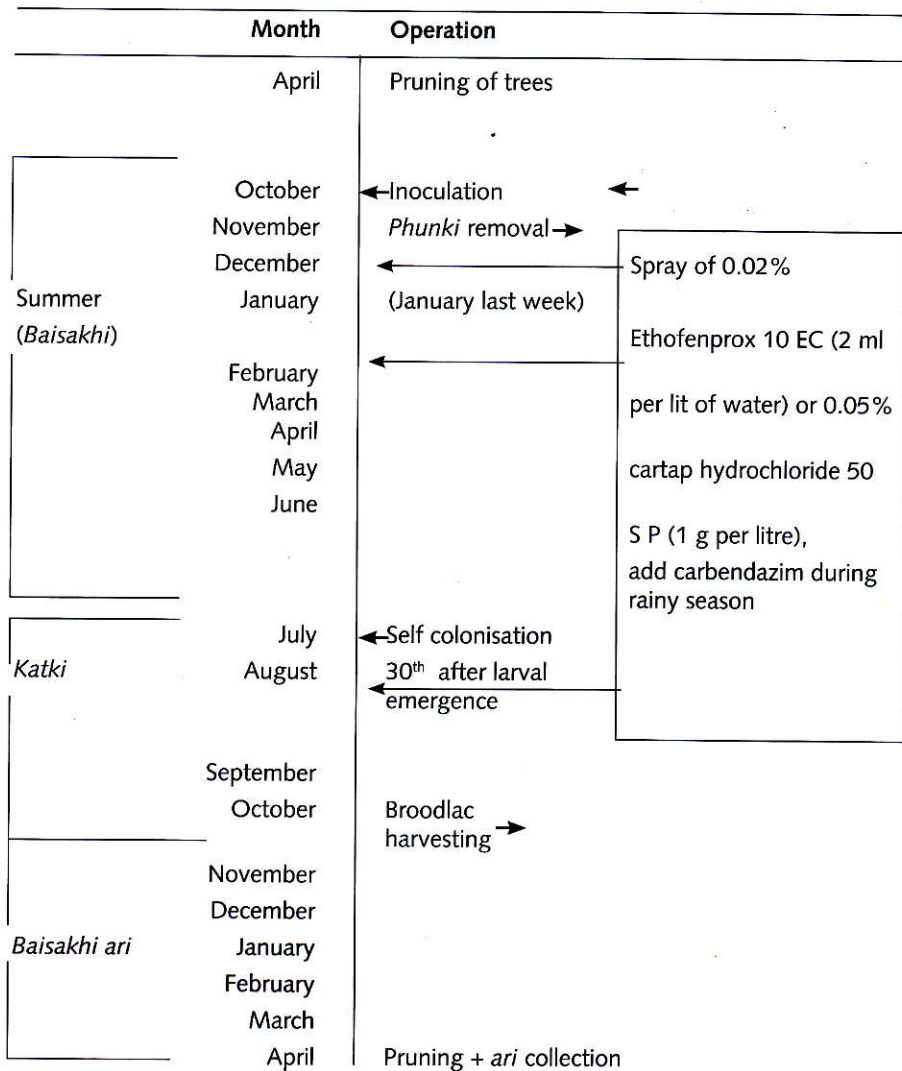
Operation	KUSUM <i>Schleichera oleosa</i>	PALAS <i>Butea monosperma</i>	BER <i>Ziziphus mauritiana</i>	SEMIALATA <i>Flemingia semialata</i>
1. Soil requirement	Prefers light well-drained boulder deposits and sandstone beds along the ravines and loamy soils.	Prefers to grow on open grassland and un-reclaimed poorly drained saline soils.	Thrives best on sandy or alluvine or aerobic (well drained) land and on a variety of soil such as laterites, open waste land	Prefers well-drained soil rich in organic matters. Water logged and marshy areas are not suitable.
2. Land preparation Size of pits spacing Number of trees lay out of plantation	60 x 60 x 75 cm deep 12 x 12 m (Triangular spacing) 70 per hectare Triangular	60 x 60 x 75 cm deep 3.6 x 3.6 m ( Triangular spacing) 770 per hectare Triangular	60 x 60 x 75 cm deep Triangular: 4.5 x 4.5 m 494 per hectare Triangular	45 x 45 x 45 cm. deep <i>semialata</i> to <i>semialata</i> : 1.00 m 10,000 per hectare (Single row system) 8,000 per hectare (Paired row system)
3. Method of Propagation	Direct sowing of 3-4 seeds /pit in March - April. After a year or so the dominant plant should be retained and rest eliminated.	Seed sown in March in nursery beds (9 x 1.2 m), dug to a depth of 0.5 m. Each seed with its pod-covering should be dibbled at a spacing 15 x 15 cm and at depth of 6 cm. The young seedlings are transplanted with balls of soil in June-July into pit prepared earlier.	Seed sown in March - April in nursery bed (9 x 1.2 m) dug to a depth of 0.5 m . The seeds after pre - treatment with conc. H <sub>2</sub> SO <sub>4</sub> for about 10 min., should be dibbled at a spacing of 15 x 15 cm. The transplanting is done as in case of <i>palas</i> .	Seed sown in March-April in nursery beds 9 x 1.2. m dug to a depth of 0.5. m The seed is sown in lines in beds. About 20 beds are sufficient for raising seedlings for one hectare of land. The nursery raised seedling are transplanted with balls of soil in June-July with the onset of monsoon rains.
4. Manuring	The soil in each pit should be well mixed with fertilisers in the following quantities. Amm. Sulphate - 30 g Potash - 30 g S S Phosphate - 50 g or Diammonium phosphate (DAP) - 50 g Urea - 10 g Murate of Potash (MOP) - 50 g	The nursery beds should be manured as follows. FYM - 50 kg / bed Manuring of pits as in <i>Kusum</i> FYM should be thoroughly mixed with soil in pits about a month before transplanting of seedlings and mixed fertiliser thereafter about a week before transplanting.	Similar as <i>Palas</i>	Manuring of Nursery beds: @ 60 kg. FYM / bed Manuring of Pits FYM : 40 q. / ha Amm. Sul. : 2.4 q / ha Single Super phosphate : 2.4 q/ha Murate of Potash : 1.2q/ha or DAP : 85 Kg Urea : 75 Kg Murate of Potash : 120 Kg

<b>Pesticides</b>	25 g chlorpyrifos 5% dust / pit should be mixed with soil before sowing to prevent termite attack.	25 g chlorpyrifos 5% dust/ pit should be mixed with soil before sowing/transplanting	Similar as <i>palas</i>	250 g chlorpyrifos 5% dust/ nursery bed 25 g/pit should be mixed with soil before sowing/transplanting to prevent termite attack.
<b>5. Irrigation</b>	Pits should be watered every 2 <sup>nd</sup> day prior to germination of seeds and occasionally thereafter till the break of monsoon.	Nursery beds should be watered once daily till the break of monsoon.	Similar to <i>palas</i> .	Nursery bed should be watered once daily till the monsoon break, watering of pits in the summer season of the next year of planting may be given for better establishment of plants

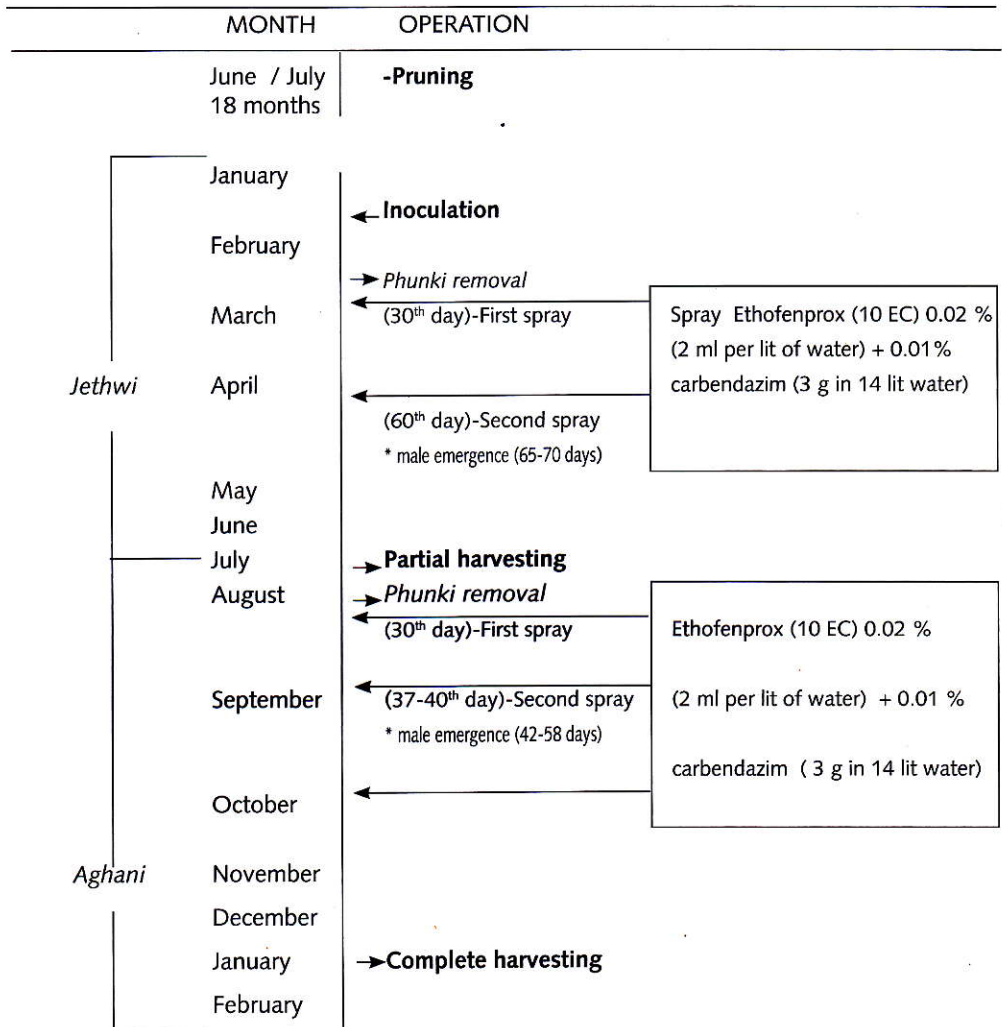
### Lac cultivation operations at a glance

Operations	<i>Schleichera oleosa</i> (KUSUM)	<i>Butea monosperma</i> (PALAS)	<i>Ziziphus mauritiana</i> (BER)	<i>Flemingia semialata and</i> <i>Albizia lucida</i>
Age of tree for lac inoculation	About 15 yrs depending upon growth of tree and formation of crown.	About 8-10 years	About 5-6 years	<i>Flemingia</i> - 2 yrs of planting <i>Albizia</i> - 4 yrs of planting
Grouping of trees	In 5 groups	Only broodlac production- 2 groups Broodlac + immature lac - 3 groups	In combination with palas; for <i>baisakhi ari</i> crop (One group <i>ber</i> + 2 groups <i>palas</i> ) In combination with <i>kusum</i> : for <i>aghani</i> broodlac crop	<i>Flemingia</i> - for <i>aghani</i> <i>Albizia</i> - for <i>jethwi</i>
Time of pruning	January/February or June/July	For raising <i>baisakhi</i> - April For raising <i>katki</i> - February	For raising <i>baisakhi</i> - May <i>Aghani</i> - February	<i>Flemingia</i> -January/February ( <i>aghani</i> ) <i>Albizia</i> - June/July ( <i>jethwi</i> )
Inoculation time brood rate	Eighteen months after pruning 20 g per metre shoot or 4-8 kg/ medium sized tree	Six months after pruning Broodlac production groups - @10 g per metre shoot or 250-350 g per tree <i>Baisakhi ari</i> group -@ 20-25 g per metre shoot or 1 kg per tree.	Six months after pruning Oct- Nov = immature <i>baisakhi</i> June- July = <i>aghani</i> 20-25 g per metre shoot or 2.0 kg/average sized tree.	<i>Flemingia</i> -January/February for <i>aghani</i> <i>Albizia</i> - June/July for <i>jethwi</i> <i>Flemingia</i> - 30 g/plant or 1.6 q/ha <i>Albizia</i> - 200-250 g/tree
Harvesting	<b>Partial harvesting</b> Six month after inoculation <b>Complete harvesting</b> One year after the inoculation. In January / February or June / July or at the time of crop maturity and simultaneously pruning.	<b>Broodlac harvesting</b> - One year after inoculation in October after allowing self inoculation in July <i>Baisakhi ari</i> - April or May and simultaneously prune the trees.	<i>Baisakhi ari</i> : May <i>Aghani</i> - February and simultaneously pruning.	<i>Flemingia</i> : January / February cut the shoot 5 cm. above ground <i>Galwang</i> : June / July, cut the lac encrusted shoots, leaving 5-8 cm from point of origin.

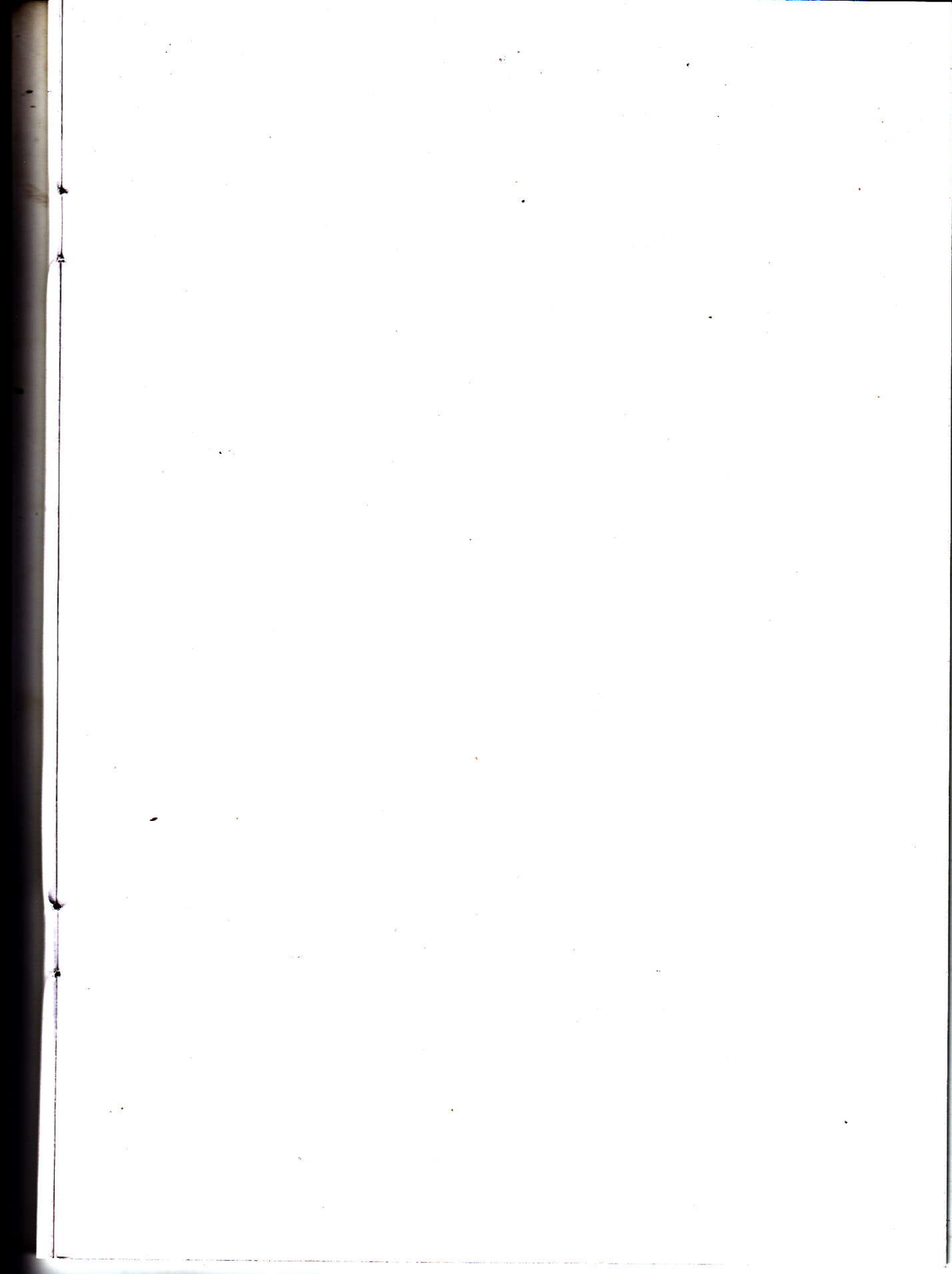
**Diagram 1. Production of broodlac on *Butea monosperma* (Palas)**



**Diagram 2.** Lac cultivation operation and spray schedule for *kusmi* crop







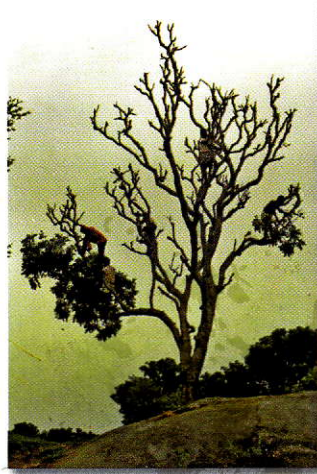


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